

Oral diuretic activity of hot water infusion of Sri Lanka black tea (*Camellia sinensis* L.) in rats

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Background: Black tea [*Camellia sinensis* (L.) O. Kuntze (family: Theaceae)] has been used by Sri Lankan traditional practitioners to promote diuresis. However, the type and grade of tea is not specified. **Materials and Methods:** This study investigates the diuretic activity of black tea infusion (BTI) in rats using Broken Orange Pekoe Fannings (BOPF) grade from three major agroclimatic elevations: high-, mid-, and low-grown. Different concentrations of BTI, furosemide (positive control) and water (vehicle) were orally administered to starved (18 h) male rats ($n = 9/\text{group}$), then hydrated. Acute and chronic (28 days) diuretic activities were assessed by measuring cumulative urine output at hourly intervals for 6 h. Electrolyte levels (Na^+ , K^+ , Ca^{2+} , H^+ , Cl^- , HCO_3^-), pH, osmolarity of urine, and glomerular filtration rate (GFR) of treated rats were determined. **Results:** Administration of BTI induced a significant ($P < 0.05$) and dose-dependent diuretic activity, which varied with the tea produced in different agroclimatic elevations. Diuretic activity had a rapid onset (1st h), peaked at 2nd h and maintained up to 4th h (except the low dose). Furthermore, there was a dose-dependent increase in micturition frequency, which peaked at 2nd h. A close association between the caffeine content of tea and diuretic activity was evident. BTI-induced diuresis was accompanied with an increased urine Na^+ level and GFR. The diuretic activity of BTI was mediated via multiple mechanisms: inhibition of both aldosterone secretion (with increased Na^+/K^+ ratio) and carbonic anhydrase [with decreased $\text{Cl}^-/(\text{Na}^+ + \text{K}^+)$ ratio] and via thiazide type of diuretic action (evaluated with increased Na^+/K^+ ratio). **Conclusion:** The Sri Lankan BOPF grade black tea possesses mild oral diuretic activity whose efficacy differs with the agroclimatic elevation of production. Furthermore, it supports the traditional claim that the black tea acts as a diuretic.

Key words: Black tea, *Camellia sinensis*, diuretic activity, electrolytes, agroclimatic elevation, urine output

INTRODUCTION

After water, brewed tea is the most consumed beverage in the world. Today, about 3–5 billion cups of tea is drunk daily by humans.^[1] Tea is manufactured from the uppermost 2 leaves and the bud of *Camellia sinensis* (L.) O. Kuntze (Family: Theaceae) plant. There are 3 main types of made tea: green tea (produced by unfermented or un-aerated process), oolong tea (produced by partially aerated process), and black tea (produced by fully aerated process).^[1] The majority of global tea drinkers (about 78%) prefer to consume black tea.^[2] Drinking of black tea is recommended in Sri Lankan traditional medicine to promote urinary flushing,^[3] possibly due to its diuretic

effect.^[4] Induced diuresis is used clinically in medicine to reduce blood pressure and edema.^[5] In black tea, diuresis is claimed to be mediated via caffeine, catechins, thearubigin and theaflavins.^[1,4] Recently, Dust grade of high-grown Sri Lankan black tea was shown to possess mild diuretic activity.^[4] It is well recognized that the phytochemical composition of black tea infusion (BTI) and its pharmacological therapeutic properties vary with several factors, including agroclimatic elevation of production and size of manufactured tea particles.^[6,7] Thus, a possibility exists that the diuretic potential of black tea could also vary depending on these factors.

Therefore, the aim of this study was to investigate the diuretic potential of BTI of Broken Orange Pekoe Fannings (BOPF) grade (larger particle size than Dust grade, which is very popular among tea bag consumers) orthodox black tea from major agroclimatic elevations in Sri Lanka: high-grown (above 1200 m, average mean sea level); mid-grown (between 600 and 1200 m, amsl); and low-grown (below 600 m, amsl) in rats.

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